

REMARKS AND REQUEST FOR RECONSIDERATION

This Response is Supplemental to the response filed February 15, 2010.

Claims 1-21 and 23-24 are pending.

Claims 1-13 and 16 are rejected under 35 U.S.C. 103(a) over Yamamoto et al., US 5,385,988.

Claims 14-15 are rejected under 35 U.S.C. 103(a) over Yamamoto et al. and Owens et al., US 3,793,402.

The rejections are traversed because the Yamamoto et al. composite alone or in combination with Owens et al. is produced by a different method and, as a result, yields a composite different from the claimed composition. More specifically, Yamamoto et al. and Owens et al. do not describe hydrolyzing the alkoxy groups until the hydrolysis is complete and reacting compounds A and B with at least one acid.

The claimed polymerizable composition is produced by reacting silicon compounds with water and at least one acid, thereby hydrolyzing the alkoxy groups until the hydrolysis is complete, adding (meth)acrylates, ethylenically unsaturated monomers, and polymers to the hydrolyzed product (claim 1).

(1) The Examiner has alleged that because the hydrolysis conditions (time, pressure, and temperature) of Yamamoto et al. are similar and also may be varied depending on the goal, the Yamamoto et al. hydrolysis *can* have the same parameters and, therefore, the hydrolysis would be *inherently* the same as in the present specification (see page 3 of the Official Action).

Applicants respectfully disagree because “inherency” means that the Yamamoto et al. hydrolysis conditions are necessarily the same as in the present specification, which is incorrect because a number of the Examples of Yamamoto et al. use different hydrolysis conditions. Even if some of the art compositions might have the claimed properties, that

possibility is not adequate to support a finding of inherency. *Ex parte Thomas*, Appeal 2007-4423 (July 23, 2008). The Examiner must provide some evidence to establish the reasonableness of the examiner's believe that the limitation is inherent. *Id.*

(2) The Examiner took the position that the present specification does not describe that all the alkoxy groups are hydrolyzed (i.e., the hydrolysis is complete), but rather describes that the hydrolysis reaction has a sufficient time, temperature and catalyst to reach the desired degree of completion (see pages 8-9 of the Official Action). The Examiner has pointed to page 15, lines 10-32 of the specification allegedly supporting his position.

The present specification on page 15 describes that the end point of the reaction can often be discerned in that the second phase (water) initially present has disappeared and a homogeneous phase is produced. It is advantageous for the hydrolyzed mixture to have a further period of standing or stirring after the hydrolysis and formation of a single phase, in order to ensure that the hydrolysis is complete. For the purposes of the present invention, the reaction a) is advantageously carried out until a homogeneous solution is obtained. The conditions of the hydrolysis reaction are selected to ensure that the hydrolysis is *complete* (lines 24-25). See also pages 36-37 describing stirring a mixture of A, B, and C until a homogeneous phase is formed.

Thus, a hydrolysate of a silicon compound in acid and water is prepared in a separate stage and is combined afterwards with other ingredients (e.g., monomers and initiators). In Comparative Example 1, the same solution as in Example 1 was formed by the solution (solution B) that was not hydrolyzed (page 37). The resultant sheets have inferior properties, i.e., the products of the Comparative Examples show an initial adhesion but not after exposure to heat, water, freezing, etc. (the Comparative Examples and page 37). The reason for this is insufficient hydrolysis as the effective concentration of MAS and water is much lower in the whole mixture compared to the pre-hydrolysate.

Thus, the specification describes that the amount of water used to hydrolyse the silicon-containing compound, is always used in excess, compared to the silicon containing compound. This ratio ensures the complete hydrolysis. Further to find out the completeness of the hydrolysis, wherein water forms a separate phase before the completion, it is observed that the separate phase is no longer visible, and, therefore, the hydrolysis is complete (see page 15).

Beari et al., “*Organofunctional Alkoxysilanes in Dilute Aqueous Solution: New Accounts on the Dynamic Structure Mutability*,” J. Organometallic Chem., 625:208, pages 1-15 (2001), describe hydrolysis of the ethoxy- or methoxy-silicon bond methoxy and silanetriols, i.e., *completely hydrolyzed*, monomeric silanes. Thus, it is clear from this publication that “completely hydrolyzed” means when all the alkoxy groups are hydrolyzed. See, e.g., “Reactivity of organofunctional silanes” section on pages 2-3.

(3) Concerning example 26 of Yamamoto et al. referred to by the Examiner, Yamamoto et al. work with vinyltrimethoxysilane, hydrochloric acid and colloidal silica acid.

A goal of Yamamoto et al. is to produce a sheet containing silica filler. See, e.g. Example 1. A prepared solution is poured into a cell formed by a gasket and two stainless steel plates. See the Examples. The outer plates/form have(s) to be removed after polymerization. Therefore, the adhesion between the polymer and the form must be low so that to provide an easy removal of the cast plate from the form, while the goal of the claimed method is to provide a good adhesion between the polymer and the glass sheets which remain in the system. See pages 1-2 and the Examples of the present specification.

Moreover, the goal of the claimed method is to achieve hydrolysis without heating and by using of a weaker and non-corrosive silicon compound (e.g., MAS; see Table 1 on page 36 of the present specification). MAS is incorporated instead of having corrosive Cl<sup>-</sup>

ions in the polymer.

Additionally, the pre-condensation prevents the self-condensation of SiOH groups for reacting with the glass surface and not with each other. The Yamamoto et al. example hydrolyzes the SiO alkyl groups primarily and then condenses them with the silica filler so that they are no longer available for the glass surface.

(4) Further, the Yamamoto et al. polymerizable composition comprises the silica polycondensate (B) and a polycondensation reaction, in addition to the hydrolysis, is performed to obtain the silica polycondensate (B) (so that further polymerization can proceed in suspension). The polymerization reaction for which the claimed polymerizable composition is prepared is a bulk polymerization (page 30, second paragraph of the present specification) which does not require protective colloids used in Yamamoto et al.

(5) Concerning claims 5-6, although Yamamoto et al. generally describe compounds of the formula (VI) that appears to encompass the claimed specific compounds (col. 3-4), the Yamamoto et al. specific compounds are different (col. 4, lines 40-43). Yamamoto et al. do not suggest selecting the claimed specific compounds from an unlimited number of the compounds (VI). Additionally, ethoxysilanes are known to hydrolyze much slower compared to methoxysilanes and, therefore, require more forced conditions.

For example, Brand et al., "*NMR-Spectroscopic Investigation on the Hydrolysis of Functional Trialkoxysilanes*," *Zeitung fur Naturforschung*, 54B:155-164 (1999), describes that the properties of 3-Methacryloxypropyltrimethoxysilane (compound 8a) and 3-Methacryloxypropyltriethoxysilane (compound 8b) (see the table on page 2) are different, as shown, e.g., in Table III on pages 7-8 (rate constants). Other alkoxysilanes and trialkoxysilane also have different properties. One would not have reasonably expected that one trialkoxysilane would have had the same properties as another trialkoxysilan because the properties of different alkoxysilane (e.g., trialkoxysilanes) are different, as shown in Brand et

al., Beari et al., and Pfeiffer, *Farbe und Lack*, 11:38-43, 2005 (see also a submitted English translation “Less is more –and quicker”), submitted with this response. For example, Pfeiffer studied various silanes and concluded that the obtained results were *surprising*. See “Ethoxy derivatives come out best for scratch resistance” section of the translation.

Thus, ethoxysilanes and methoxysilanes are not equivalent and one would not have expected ethoxysilanes and methoxysilanes to have the same properties.

Thus, although Yamamoto et al. describe the components of the composite encompassing some of the claimed components, the Yamamoto et al. composite is different from the claimed composition. Yamamoto et al. do not describe hydrolyzing the alkoxy groups until the hydrolysis is complete and reacting compounds A and B with at least one acid.

(6) In addition, the Yamamoto et al. composite composition, the silica skeleton of a silica polycondensate is derived from colloidal silica and a silane compound hydrolyzed and *polycondensed on the surface of the colloidal silica*. The Yamamoto et al. composition further comprises a polymer of a radical-polymerizable vinyl compound forming a semi-interpenetrating network structure (col. 2, lines 4-16). The silica polycondensate (B) is obtained by hydrolysis and polycondensation of a silane compound (col. 3, lines 3-23). During this reaction, most of  $\text{OR}_3$  groups contained in the silane compound are hydrolyzed, but some  $\text{OR}_3$  or OH groups *still remain* on the outer surface of the silica polycondensate (B) (col. 3, lines 18-24). Another words, Yamamoto et al. describe hydrolyzing the silica compound (I) so that some groups are still available (col. 3, lines 3-23). The obtained polycondensate (B) can be uniformly dispersed in the radical-polymerizable vinyl compound (A) (col. 3, lines 18-23). After forming the polycondensate (B) by hydrolysis and polycondensation of a silane compound, a polymerization with the vinyl compound (A) is

carried (see claim 1 of Yamamoto et al.). Yamamoto et al. disclose that 0.1 to 2,000 wt. parts of silane compounds is used per 100 parts of the colloidal silica (claim 1).

Thus, hydrolysis and polycondensation of a silane compound *on the surface of the colloidal silica* forming the silica polycondensate (B) are carried out before polymerization and, therefore, the Yamamoto et al. composition is different from that claimed *prior* to polymerization (see the Examiner's assertion that prior to polymerization the Yamamoto et al. and the claimed compositions are the same, Official Action of February 12, 2008, page 7).

The claimed composition does not comprise the colloidal silica and does not form the silica *polycondensates* on the surface of the colloidal silica forming a dispersion of the colloidal silica in the radical-polymerizable vinyl compound causing gelation (see Yamamoto et al., col. 3).

The components A to C of claim 1 (A is a silane derivative; B is water, and C is an acid) are not condensed to colloidal particles but instead are used in combination merely for hydrolyzing the alkoxy groups of the functional alkoxy silane (and transforming the groups into hydroxyl groups) (see pages 14-15 of the present specification) in order to make the groups accessible for the following reaction with the silicate glass. No silica polycondensates forming a dispersion of colloidal silica in the radical-polymerizable vinyl compound causing gelation are formed. In fact, forming silica polycondensates is not even possible in the claimed polymerizable composition because the hydrolyzed silanes are to be consumed for binding the forming polymers to the silicate glass.

(7) The Examiner has not addressed Applicants' arguments that (i) the silica skeleton of Yamamoto et al. is derived from colloidal silica and a silane compound hydrolyzed and polycondensed on the surface of the colloidal silica, and (ii) only after forming the

polycondensate (B) by hydrolysis and polycondensation of silane compounds, the polymerization with the vinyl compound (A) is carried out.

Thus, Yamamoto et al. do not describe or suggest the claimed polymerizable composition.

Owens et al. do not cure the deficiency of Yamamoto et al. Owens et al. describe an impact resistant thermoplastic composition comprising a multi-stage sequentially produced polymer (col. 1). The Owens et al. composition comprises homopolymers of an alkyl methacrylate (claim 1; col. 11, lines 35-51). Owens et al. do not describe the claimed polymerizable composition because the Owens et al. composition does not comprise the claimed components and is produced by a different method.

Substituting the alkyl methacrylate of Owens et al. into the Yamamoto et al. composite still does not produce the claimed polymerizable composition.

Thus, Yamamoto et al. and Owens et al. do not make the claimed composition obvious. Applicants request that the rejections be withdrawn.

A Notice of Allowance for all pending claims is requested.

Respectfully submitted,

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